



Laying out dovetails

BY CHRIS GOCHNOUR

Striking a perfect blend of form and function, dovetail joints add great interest and detail while enhancing the structural integrity of a case, box, or drawer.

Cutting dovetails can become second nature after plenty of practice with saw and chisel. Dovetail layout, on the other hand, is where I see students get frustrated. Here are the key steps in laying out a basic through-dovetail joint, with tips on creating an attractive joint that is sturdy enough to last generations.

How to balance aesthetics and strength

Several factors go into the design of a dovetail joint. These include the size and spacing of the tails and pins, and the slope of the tails (see drawings, below).

Most dovetail joints begin and end with a half-pin on the outside, with the rest of the space subdivided into multiple pins

and tails. This creates plenty of long-grain glue surfaces as well as mechanical strength to tie the elements together.

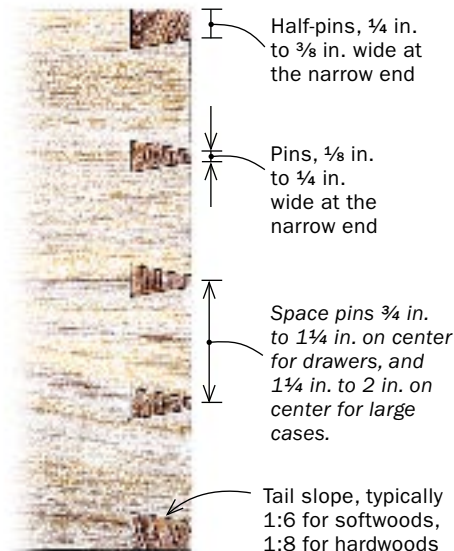
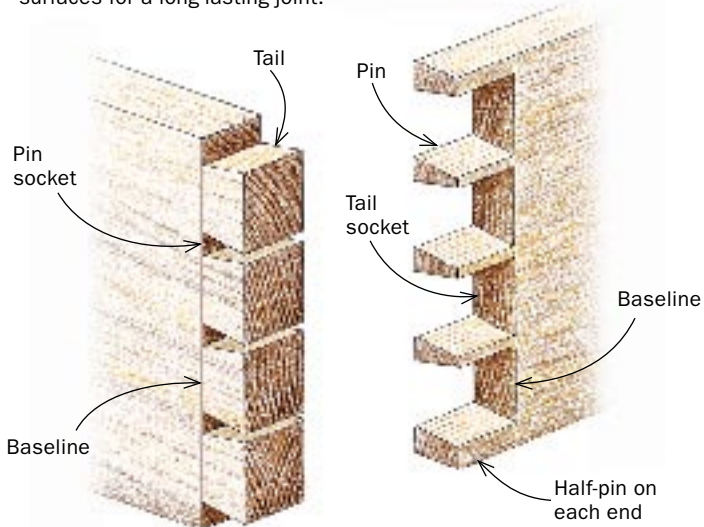
A common practice is to span the joint with pins and tails of equal proportions. Although it's structurally very sound and typical of machine-cut dovetails, this joint has little design appeal. A better method is to span the joint with tails that are larger than the pins (see right drawing, below). This is a common practice with hand-cut dovetails and also can be done on the bandsaw or tablesaw, as well as with the better machine-dovetail systems.

I recommend sizing the half-pins on the outer edges from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. at their narrow end. Interior pins range from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. wide and can be spaced anywhere from $\frac{3}{4}$ in. to 2 in. on center, depending on the application.

Last, it's important to choose an appropriate slope, or angle, for the tails.

Anatomy of a strong joint

Dovetails provide not only mechanical strength as the pins and tails interlock, but also plenty of long-grain-to-long-grain glue surfaces for a long-lasting joint.



PIN AND TAIL DIMENSIONS

TIP



Sizing pins for router-cut dovetails. If you plan to cut dovetails with a router, the minimum pin width will be dictated by the diameter at the base of the bit.

Set the tail spacing

Gochmour lays out and cuts the tails first. His method uses the narrowest dimension of the pins, and simple math, to divide the tail board evenly.



1 **Mark the pin width.** Stack both tail boards in the vise. After laying out half-pins, mark the pin width on one end.

That slope is what draws the pin board up tight during assembly. More slope pulls the joint together efficiently; too little slope may require clamps or other aids to pull the joint together, much like a box or finger joint requires clamping pressure in two directions. Partly a matter of preference, the traditional ratio is 1:6 for softwoods and 1:8 for hardwoods; the reason being that the fibers of softwoods can compress more easily and therefore require a bit more angle to ensure that the pins are drawn tight to the tail board.

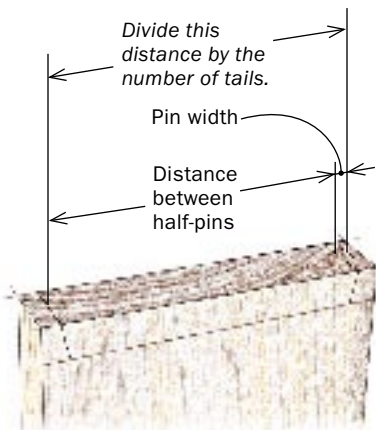
Keep the layout process simple

When laying out dovetails, use as few steps as possible. Begin by marking out the orientation of the pin and tail boards: inside and outside faces, top and bottom, front and back. Remember that tail boards generally make up the sides of drawers and cases, and the fronts and backs of chests; pin boards are usually the fronts and backs of drawers, tops and bottoms of cases, and ends of chests.

Scribe baselines—With the orientation of the tail board and the pin board established, scribe the baselines on both using a marking gauge. Set the gauge to the exact thickness of the pin board and scribe the tail board on both faces and edges. Setting the gauge to the pin board's exact thickness means there are no proud pins to interfere with clamping



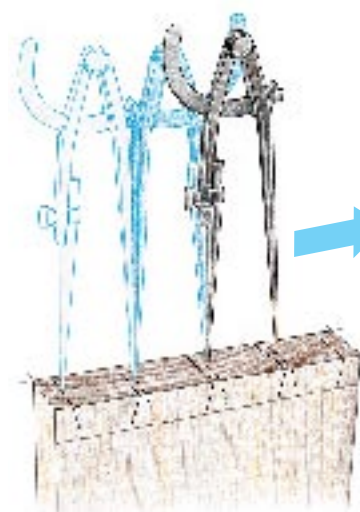
2 **Measure from the half-pin mark on one end to the pin-width mark on the other.** Divide that distance by the number of tails; adjust the dividers to this dimension.



3 **Mark the left edges of the tails.** Place one point of the dividers on the right half-pin line and walk the dividers across the end grain.



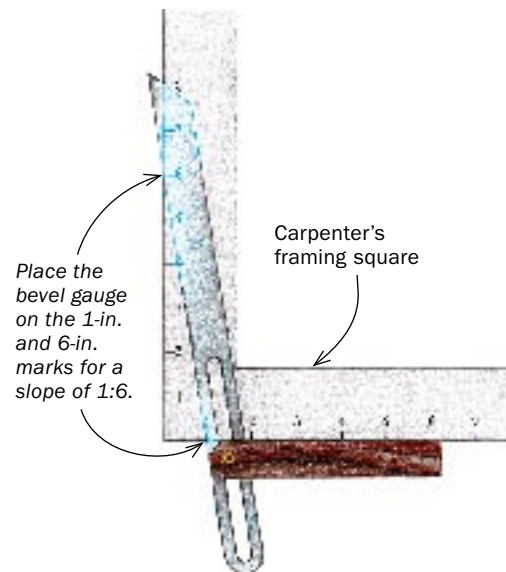
4 **Mark the right edges of the tails.** Repeat the process beginning from the left half-pin line.



Mark the tail board



Mark the widths of the tails on the end. Set the pencil point into the depressions from the points of the dividers, slide a square up to the pencil point, and draw lines across.



Set a bevel gauge to the desired slope. Lay a bevel gauge across a carpenter's framing square to set the slope.

and leaves little to trim flush after glue-up. After scribing the tail board, scribe the inside and outside faces of the pin board in the same way.

Determine tail spacing—Though some woodworkers will argue that it's best to lay out and cut the pins first, I prefer to work the tails first for a few reasons. First, I can lay out and cut more than one tail board at a time. Second, I find it easier to align, hold, and transfer the tails to the pin board because the pin board can be held securely in a vise and the tail board can lay horizontally, easily registering on the pin-board ends. Last, any adjustments or fine-tuning during assembly will be done to the pins, and it is much easier to trim and fit the open, right-angled pins than the tight, angular confines of the tails.

Clamp both tail boards in a shoulder vise so that they are 2 in. to 3 in. above the benchtop and square to it. Measure and mark the half-pins across the ends of the boards and perpendicular to the faces. Now divide the tails based on the number

that you want and the pin sizes between them (see drawings and photos, p. 30).

For example, say you want four tails with $\frac{3}{16}$ -in.-wide pins and two $\frac{3}{8}$ -in. half-pins. Lay out the half-pins $\frac{3}{8}$ in. from both edges, then make a mark on the end of the tail board $\frac{3}{16}$ in. past the half-pin mark on the right side (this distance is based on the width of the full pins). Then measure from that mark to the half-pin mark on the left side. Say that distance equals $6\frac{1}{2}$ in. Because you want four tails, divide the $6\frac{1}{2}$ in. by 4, which equals $1\frac{5}{8}$ in. Now adjust a set of dividers with the points $1\frac{5}{8}$ in. apart.

Lay one point of the divider on the right half-pin and walk it across the board end until you pass the half-pin on the left. If



Mark the tails on the face. Use the bevel gauge to draw in the tails on the face of the board.



TIP

Saddle markers speed the process. A dovetail saddle marker allows you to draw the lines on the end and face of a board in one step and with one tool. These jigs come with preset slopes, or you can make one based on your preference.

your math has been done correctly, the divider should be $\frac{3}{16}$ in. past this mark. Now put one of the divider points on the left half-pin mark and walk back across the board end to the right.

Mark out the tails—The divider technique will leave a series of impressions spaced appropriately, in this case $\frac{3}{16}$ in. apart. Place a sharp pencil in each impression, slide a square up to the pencil, and square a line across the ends of the boards.

Next, set a bevel gauge to the appropriate slope (see drawing and photo, p. 32) and mark the face of the tail board. A dovetail saddle marker can be handy here because it allows you to draw the two lines across the top and down the face quickly and without misalignment. Dovetail saddle markers generally come with one of two slope ratios, 1:6 or 1:8, and are available from a number of sources, such as www.leevalley.com.

Now you're ready to cut the tails and remove the waste. The

Mark the pin board



Use the tail board to mark out the pins. Line up the baseline of the tail board with the inside edge of the pin board. Now use a marking knife to transfer the tail locations clearly to the pin board.

end-grain cuts must be absolutely perpendicular to each face of the board. Otherwise, during the next step the information transferred from inside the boards will not match the outside, causing problems.

Transfer layout to the pin board—With the tails laid out, cut, and pared, secure the pin board in the shoulder vise, with its outside facing you and its end $2\frac{1}{2}$ in. to 3 in. above the benchtop.

Place the tail board with the outside face up on the end of the pin board. Use a spacer to keep the tail board level (see the photo above). Line up the baseline of the tail board with the inside edge of the pin board. If the tail's baseline overlaps the pin board's inner edge, the tails will be too tight. If the baseline is proud of the pin board's inner face, the pins will be too small, resulting in a loose joint.

Holding the tail board securely—use clamps if needed—knife in the tails clearly on the pin board. Extend the marks perpendicularly down the pin board's face to the baseline. Now you are ready to cut the pins and complete the joint. □

HAVE FUN WITH DOVETAIL LAYOUT

Mastering the basics of dovetailing opens the doors to many design options, allowing you to increase the strength of the joint as needed or add visual pop. Each of these designs works with the layout process described in this article.



ADD PINS AND TAILS

This joint has enough pins to ensure that the joint is sound, but not so many that the joint is laborious to execute. The 1:6 slope of the tails ensures that the pin board is drawn up tight during assembly.



INCREASE THE SLOPE OF THE TAILS

This joint has a unique visual appeal and a great ability to draw the pins up tight. It also leaves a lot of short grain on the tails, creating a potential weak spot.



ADD PINS AT THE ENDS

The outer edges of a joint are the most susceptible to failure. Fortifying the edge with an extra pin is a great way to strengthen this potentially weak corner. It looks good, too.



ALTERNATE TAIL WIDTHS

The sky is the limit in what can be done to capitalize on both the form and the functional aspects that the dovetail joint affords the craftsman.